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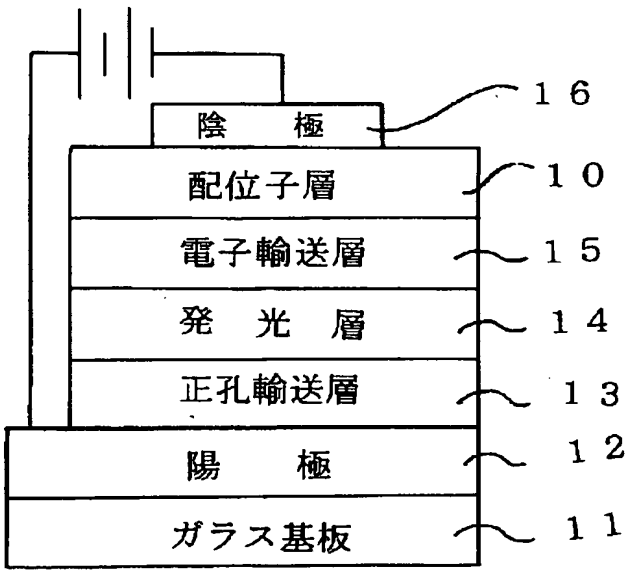
(54)【発明の名称】　有機発光素子

(57)【要約】
【課題】　陰極材成分（金属）が有機層に入って拡散することによって生ずる発光輝度の低下とリーク電流による発光の不能化を解決した有機発光素子を提供すること。
【解決手段】　透明なガラス基板１１の面上に、透明な陽極１２、正孔輸送層１３、発光層１４、電子輸送層１５、配位子層１０、陰極１６を順次成膜形成し、配位子層１０の配位子が陰極材成分と錯体を形成し、有機層（１３、１４、１５）に拡散しようとする陰極材成分を防止する構成となっている。



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【特許請求の範囲】

【請求項１】　透明基板面に成膜形成した透明な陽極と、この陽極の膜面に積層した有機層と、この有機層の面上に成膜形成した陰極とからなる有機発光素子において、

有機層と陰極との界面に金属と錯体形成する配位子層を設け、陰極から有機層に拡散する陰極材成分を防止する構成としたことを特徴とする有機発光素子。

【請求項２】　透明基板面に成膜形成した透明な陽極と、この陽極の膜面に積層した有機層と、この有機層の面上に成膜形成した陰極とからなる有機発光素子において、

有機層に金属と錯体形成する配位子を混入させ、陰極から有機層に拡散する陰極材成分を防止する構成としたことを特徴とする有機発光素子。

【請求項３】　透明基板面に成膜形成した透明な陽極と、この陽極の膜面に積層した有機層と、この有機層の面上に成膜形成した陰極とからなる有機発光素子において、

有機層のポリマーマトリックス中に金属と錯体形成する配位子を分散させて配位子層を形成し、陰極から有機層に拡散する陰極材成分を防止する構成としたことを特徴とする有機発光素子。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】この発明は、有機薄膜のエレクトロルミネッセンス現象を利用した有機発光素子に関する。

【０００２】

【従来の技術】図９は有機発光素子の簡略構成図である。図示するように、この有機発光素子は、陽極１２を膜形成した透明なガラス基板１１の上に、正孔輸送層１３、発光層１４、電子輸送層１５を順次膜形成し、さらに、電子輸送層１５に陰極１６を膜形成した構造となっている。なお、ガラス基板１１は、透明なプラスチック材で形成されたものがある。

【０００３】陽極１２は、仕事関数の大きい金属や合金によって形成されている。具体的には、Ａｕ（銅）、ＩＴＯ（インジウムースズの酸化物）、SnO_2（酸化スズ）、ＺｎＯ（酸化亜鉛）などを使って形成した透明導電性膜の電極となっている。なお、電極１２は上記の電極物質を真空蒸着やスパッタリングなどの方法によって薄膜形成されている。

【０００４】また、正孔輸送層１３、発光層１４、電子輸送層１５は有機材（有機化合物）によって膜形成されている。具体的には、トリス（８－ヒドロキシキノリラト）アルミニウム（Alq_3）及びN，Ｎ－ビス（３－メチルフェニル）－N，Ｎ－ジフェニル－（１，１’－ビフェニル）－４，４’－ジアミン（ＴＰＤ）によって代表される低分子系材料、ポリ－Ｐ－フェニレンビニレン(ＰＰＶ)誘導体によって代表される高分子系材料が使用されている。

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【０００５】上記陰極１６は、仕事関数の小さい金属や合金、または、これら金属や合金の混合物によって形成されている。具体的には、Ｃａ（カルシウム）、Ａｌ（アルミニウム）、Ａｌ－Ｌｉ（リチウム）合金、Ｍｇ（マグネシウム）－Ａｇ（銀）合金、Ｍｇ－Ａｌ合金、Ｍｇ－Ｉｎ（インジウム）合金などを真空蒸着やスパッタリングなどの方法によって薄膜形成した電極となっている。

【０００６】上記した有機発光素子は、陽極１２と陰極１６とに直流電圧を印加することにより、陽極１２より注入される正孔が正孔輸送層１３を経て発光層１４に送られる。また、陰極１６より注入される電子が電子輸送層１５を経て発光層１４に送られる。発光層１４では正孔と電子とが再結合し、これによって発光層１４の有機材が励起状態となり励起子が生成する。

【０００７】このように生成した励起子は発光層１４内を拡散し、続いてその基底状態へと脱励起され、その時に発光し、この発光が正孔輸送層１３、陽極１２、ガラス基板１１を通って射出される。

【０００８】図１０は、発光層１４が電子輸送層１５を兼ねるように構成された有機発光素子の簡略構成図である。この発光素子は、ガラス基板１１に陽極１２を膜形成し、その上に、正孔輸送層１３と発光層１４が積層されており、陰極１６が発光層１４に膜形成されている。

【０００９】図１１は、発光層１４が正孔輸送層１３を兼ねる有機発光素子の簡略構成図である。この発光素子は、ガラス基板１１に陽極１２を膜形成し、その上に発光層１４と電子輸送層１５とが積層されており、陰極１６が電子輸送層１５に膜形成されている。

【００１０】図１２は、正孔輸送層１３と電子輸送層１５を備えない有機発光素子の簡略構成図である。この発光素子は、ガラス基板１１に陽極１２を膜形成し、その上に発光層１４が積層されており、陰極１６が発光層１４に膜形成されている。

【００１１】図１０、図１１、図１２に示す有機発光素子は、図９に示した有機発光素子と同様に陽極１２と陰極１６とに直流電圧を印加することにより発光し、この発光が陽極１２とガラス基板１１を通って射出する。

【００１２】

【発明が解決しようとする課題】上記した有機発光素子は、発光駆動中に陰極材成分が発光層やその他の有機層内に入って拡散することから、拡散する陰極材成分のために発光輝度が低下する。

【００１３】また、有機層内に陰極材成分が拡散すると、この陰極材成分を通して陽極にリーク電流が流れることがあり、このため、有機発光素子が発光しないことがあるという問題が生ずる。

【００１４】本発明は上記した実情にかんがみ、有機層

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に入る陰極材成分を防止して発光輝度を高め、かつ、確実に発光する有機発光素子を提供することを目的とする。

【００１５】

【課題を解決するための手段】上記した目的を達成するため、本発明は、透明基板面に成膜形成した透明な陽極と、この陽極の膜面に積層した有機層と、この有機層の面上に成膜形成した陰極とからなる有機発光素子に関する。

【００１６】そして、第の１発明では、有機層と陰極との界面に金属と錯体形成する配位子層を設け、陰極から有機層に拡散する陰極材成分を防止する構成としたことを特徴とする有機発光素子を提案する。

【００１７】第２の発明としては、有機層に金属と錯体形成する配位子を混入させ、陰極から有機層に拡散する陰極材成分を防止する構成としたことを特徴とする有機発光素子を提案する。

【００１８】第３の発明としては、有機層のポリマーマトリックス中に金属と錯体形成する配位子を分散させて配位子層を形成し、陰極から有機層に拡散する陰極材成分を防止する構成としたことを特徴とする有機発光素子を提案する。

【００１９】

【作用】このように構成した有機発光素子は、有機層と陰極との間、或いは、有機層のポリマーマトリックス中

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に設けた配位子層または有機層に混入させた配位子が陰極材成分と錯体形成し、有機層に拡散する陰極材成分が防止される。この結果、陰極材成分による発光輝度の低下がなく、また、陰極材成分を通して陽極に流れるリーク電流が発生しない。

【００２０】

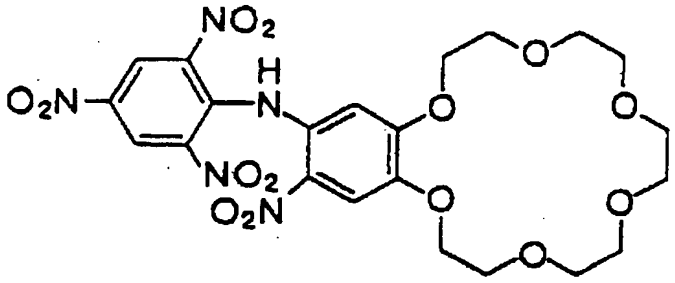
【発明の実施の形態】次に、本発明の実施形態について図面に沿って説明する。図1は、配位子層を設けた有機発光素子の実施形態を示す簡略構成図である。

【００２１】本実施形態の有機発光素子は、透明なガラス基板１１（または、透明なプラスチック基板）１１の面上に、透明な陽極１２、正孔輸送層１３、発光層１４、電子輸送層１５を従来例同様に順次成膜形成し、さらに、電子輸送層１５の上に配位子層１０を薄膜形成し、この配位子層１０の面上に陰極１６を金属電極として成膜形成した構成としてある。

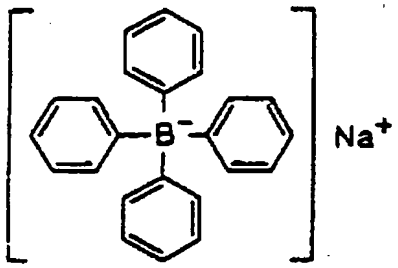
【００２２】上記のように電子輸送層１５と陰極１６との間に設けた配位子層１０は、陰極材成分（金属）と錯体を形成するバッファ層として作用する。つまり、陰極１６から有機層（１３、１４、１５）へ拡散しようとする金属を配位子層１０で錯体を形成させ、有機層への拡散を防止する。

【００２３】上記した配位子層１０は次に示すような配位子材料を用いることができる。

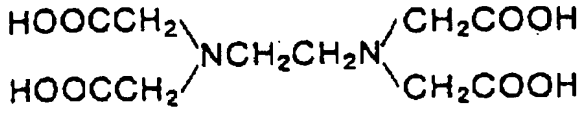
クラウンエーテル誘導体



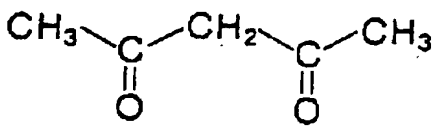
テトラフエニルボレート誘導体



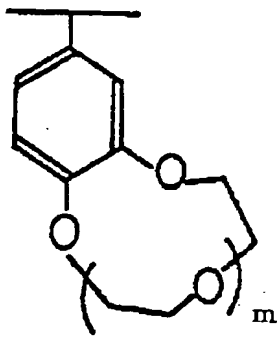
アミン系化合物



ジケトン化合物



高分子配位子



m＝３，４

【００２４】また、配位子層１０は、上記の配位子材料を用い、スピンコート、ディップコートなどのウェットプロセス、或いは、真空蒸着などのドライプロセスによって薄膜形成することができる。

【００２５】図２は、発光層１４が電子輸送層を兼ねる従来例同様の有機発光素子に実施する形態で、この発光素子の場合は、発光層１４と陰極１６との間に上記した配位子層１０を設ける。

【００２６】図３は、発光層１４が正孔輸送層を兼ねる従来例同様の有機発光素子に実施する形態で、この発光素子の場合は、正孔輸送層１５と陰極１６との間に上記した配位子層１０を設ける。

【００２７】図４は、発光層１４が電子輸送層と正孔輸送層とを兼ねる従来例同様の有機発光素子に実施する形態で、この発光素子の場合は、発光層１４と陰極１６との間に上記した配位子層１０を設ける。

【００２８】一方、配位子層は、成膜性の向上、配位子量の調整のために、有機層のポリマーマトリックス中に分散させた膜として設けることができる。

【００２９】すなわち、ウェットプロセスで配位子層を成膜形成する場合、有機材料であるポリスチレン、ポリメタクリル酸メチル、ポリカーボネート等の高分子化合物と共に配位子材料を溶媒にとかして成膜することによって、ポリマーマトリックス中に配位子分散させた配位子層を形成することができる。

【００３０】また、ドライプロセスで成膜形成する場合は、ポリマーの蒸着重合時に配位子材料を同時に蒸着してポリマーマトリックス中に配位子を分散させることによって配位子層を形成することができる。

【００３１】

【実施例１】ガラス基板１１に陽極１２としてＩＴＯを薄膜形成した基板の面上に、発光層１４として、ｐｏｌｙ（２－ｍｅｔｈｏｘｙ，５－（２’－ｅｔｈｙｌ－ｈｅｘｏｘｙ）－１，－ｐｈｅｎｙｌｅｎｅ－ｖｉｎｙｌｅｎｅ）（ＭＥＨ－ＰＰＶ）をスピンコートにより成膜し、その上に配位子層１０として、アセチルアセトンをスピンコートにより積層し、さらに、陰極１６として、Ｃａを蒸着し、続いて、Ａｌを蒸着して成膜し、有機発光素子を構成した。

【００３２】この有機発光素子を駆動して評価したところ、初期の輝度低下がなく、輝度の半減時間が４倍程度に延びた。（従来品：初期の輝度低下率は４０％、輝度の半減時間は５時間）また、リーク電流によって発光しなくなる現象は見られなかった。なお、初期の輝度低下率は、初期段階で輝度が低下する物の率、半減時間は、輝度が半減するまでの時間である。

【００３３】図５は、有機層に配位子を混入させた有機発光素子の実施形態を示す簡略構成図である。本実施形態の有機発光素子は、透明なガラス基板（または、透明なプラスチック基板）１１に、透明な陽極１２を膜形成した基板に、正孔輸送層１３Ｃ、発光層１４Ｃ、電子輸送層１５Ｃ、陰極１６を順次に成膜形成した構成となっている。

【００３４】この有機発光素子において、陽極１２と陰極１６は従来例と同様のものであるが、正孔輸送層１３Ｃ、発光層１４Ｃ、電子輸送層１５Ｃの有機層については、従来例で説明した有機材料に配位子材料を混入させて成膜してある。

【００３５】配位子材料は、上記したように、クラウンエーテル誘導体、テトラフェニルボレート誘導体、ＥＤＴＡなどのアミン系化合物、アセチルアセトンなどのジケトン系化合物、また、これらを官能基として含むポリマー（高分子配位子）を用いることができる。

【００３６】正孔輸送層１３Ｃ、発光層１４Ｃ、電子輸送層１５Ｃに配位子を混入させる手段としては、有機材料と配位子材料とを溶解させ、ウェットプロセスによって成膜し、或いは、ドライプロセスによって有機材料と配位子材料とを同時蒸着して成膜することができる。

【００３７】このように構成した有機発光素子は、有機

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層に混入させた配位子が金属と錯体を形成することから、有機層に拡散する陰極材成分が減少する。この結果、発光輝度の低下が少なく、リーク電流についても減少し発光が確実なものとなる。

【００３８】図６は、電子輸送層１５Ｃを備えない有機発光素子の実施形態を、図７は正孔輸送層１３Ｃを備えない有機発光素子の実施形態を、図８は正孔輸送層１３Ｃと電子輸送層１５Ｃを備えない有機発光素子の実施形態を各々示す。

【００３９】なお、配位子は、正孔輸送層１３Ｃ；発光層１４Ｃ、電子輸送層１５Ｃの全ての層に混入してもよいが、それらのうちの２層或いは一層について混入させる構成としてもよい。

【００４０】

【実施例２】ガラス基板１１に陽極１２としてＩＴＯを成膜して素子基板を形成した。そして、発光性の有機材料であるＭＥＨ－ＰＰＶの中に、配位子材料としてアセチルアセトンを１０ｗｔ％混入し、これらの材料をスピンコートによって上記素子基板面に成膜形成し、続いて、ＣａとＡｌを蒸着により成膜して有機発光素子を構成した。

【００４１】このように構成した有機発光素子を駆動して評価したところ、初期の輝度低下がなく、輝度の半減時間が３倍程度に延びた。（従来品：初期の輝度低下率が４０％、輝度の半減時間は５時間）

また、リーク電流によって発光しなくなる現象は見られなかった。

【００４２】以上、本発明の実施形態について説明したが、上記した他に、ウェットプロセス、ドライプロセスで成膜した有機層上に配位子材料を置き、熱をかけて熱拡散させる方法によっても実施することが可能である。

【００４３】

【発明の効果】上記した通り、本発明では、配位子が陰極材成分と錯体を形成し、有機層に拡散する陰極材成分を極力減少させる構成としたことから、発光輝度の低下が少なく、その上、確実に発光する有機発光素子となる。

8

【図面の簡単な説明】

【図１】配位子層を設けた実施形態を示す有機発光素子の簡略構成図である。

【図２】発光層が電子輸送層を兼ねる構成の有機発光素子の実施形態を示す図１同様の簡略構成図である。

【図３】発光層が正孔輸送層を兼ねる構成の有機発光素子の実施形態を示す図１同様の簡略構成図である。

【図４】発光層が電子輸送層と正孔輸送層を兼ねる構成の有機発光素子の実施形態を示す図１同様の簡略構成図である。

【図５】正孔輸送層、発光層、電子輸送層に配位子を混入させた実施形態を示す有機発光素子の置簡略構成図である。

【図６】発光層が電子輸送層を兼ねる構成の有機発光素子の実施形態を示す図５同様の簡略構成図である。

【図７】発光層が正孔輸送層を兼ねる構成の有機発光素子の実施形態を示す図５同様の簡略構成図である。

【図８】発光層が電子輸送層と正孔輸送層を兼ねる構成の有機発光素子の実施形態を示す図５同様の簡略構成図である。

【図９】従来例として示した有機発光素子の簡略構成図である。

【図１０】発光層が電子輸送層を兼ねる構成の従来の有機発光素子を示す図９同様の簡略構成図である。

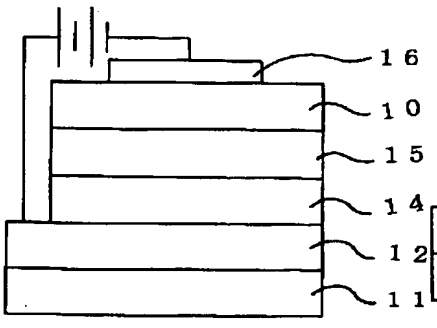
【図１１】発光層が正孔輸送層を兼ねる構成の従来の有機発光素子を示す図９同様の簡略構成図である。

【図１２】発光層が正孔輸送層と電子輸送層とを兼ねる構成の従来の有機発光素子を示す図９同様の簡略構成図である。

【符号の説明】

１０　配位子層
１１　ガラス基板
１２　陽極
１３、１３Ｃ　正孔輸送層
１４、１４Ｃ　発光層
１５、１５Ｃ　電子輸送層
１６　陰極

【図３】



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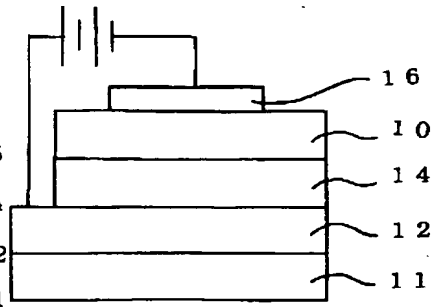

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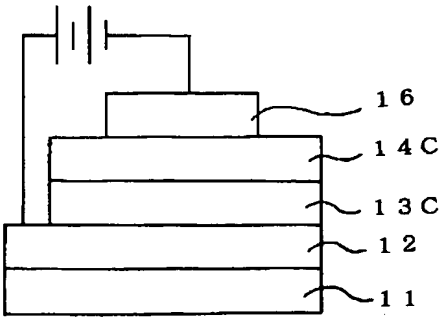
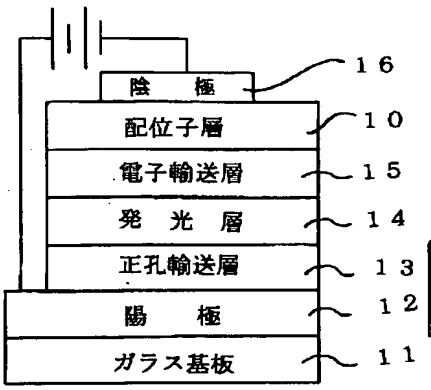


【図１】



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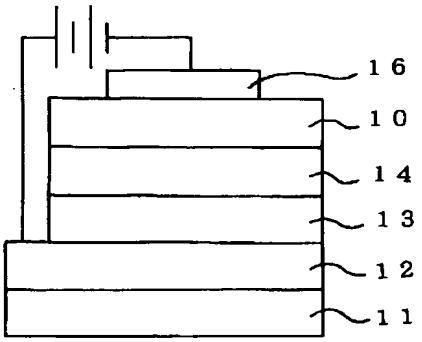

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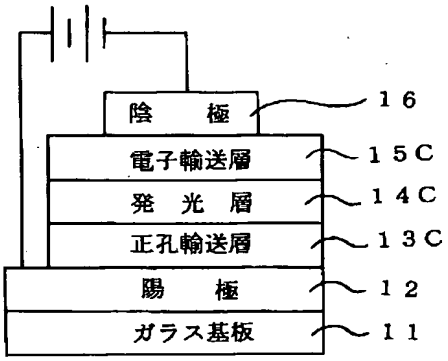

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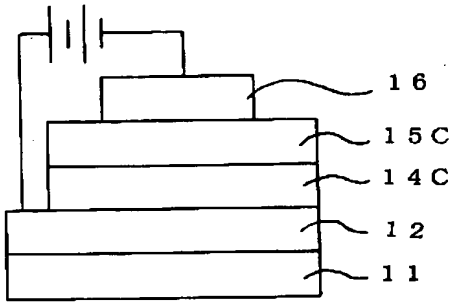

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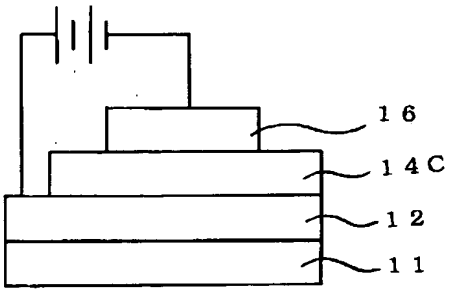

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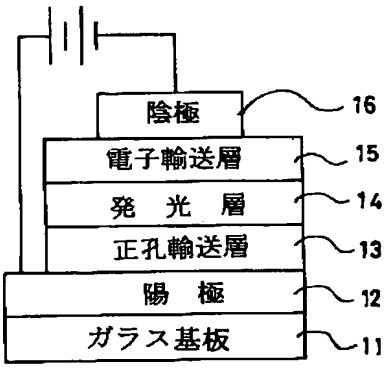
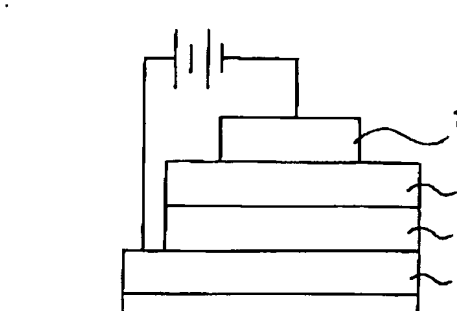
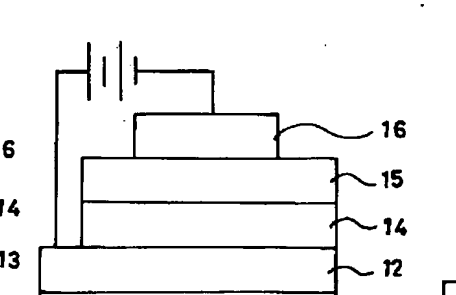


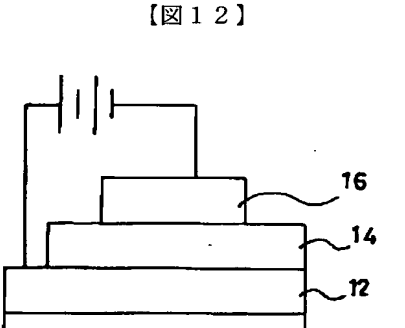
【図１０】



【図１１】



【図１２】



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(22)Date of filing : 15.12.2000

(71)Applicant : STANLEY ELECTRIC CO LTD

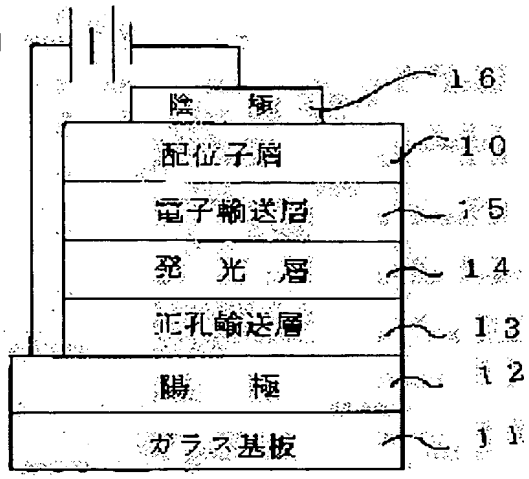
(72)Inventor : HAYASHI TAKAKO

(54) ORGANIC LUMINESCENT ELEMENT

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an organic luminescent element which prevents degradation of emission brightness generated by dispersing of cathode material components metal in an organic layer, and resolves of luminescent failure by leaking current.

SOLUTION: A transparent anode 12, an electron-hole carrier layer 13, a luminescent layer 14, an electron carrier layer 15, a ligand layer 10 and a cathode 16 are formed into films sequentially on a transparent glass substrate 11, where, a ligand of the ligand layer 10 forms a complex with a cathode material component so as to prevent the cathode material component from dispersing into the organic layers 13, 14, 15.



LEGAL STATUS

[Date of request for examination]

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[Patent number]

[Date of registration]

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[Date of extinction of right]

CLAIMS

[Claim(s)]
[Claim 1] The organic light emitting device characterized by to consider as the configuration which prevents the cathode material component which prepares the ligand layer which carries out complexing to a metal in a transparence substrate side at the interface of an organic layer and cathode in the organic light emitting device which consists of cathode which carried out membrane-formation formation on the field of the transparent anode plate which carried out membrane-formation formation, the organic layer which carried out the laminating to the film surface of this anode plate, and this organic layer, and diffuses in an organic layer from cathode.
[Claim 2] The organic light emitting device characterized by to consider as the configuration which prevents the cathode material component which an organic layer is made to mix in a transparence substrate side the ligand which carries out complexing to a metal in the organic light emitting device which consists of cathode which carried out membrane-formation formation on the field of the transparent anode plate which carried out membrane formation formation, the organic layer which carried out the laminating to the film surface of this anode plate, and this organic layer, and is diffused in an organic layer from cathode.
[Claim 3] The organic light emitting device characterized by to consider as the configuration which prevents the cathode material component which make distribute the ligand which carries out complexing to a metal into the polymer-matrix of an organic layer, forms a ligand layer in the organic light emitting device which consists of cathode which carried out membrane-formation formation on the field of the organic layer which carried out the laminating in the transparence substrate side at the film surface of the transparent anode plate which carried out membrane-formation formation, and this anode plate, and this organic layer, and diffuses in an organic layer from cathode.

[Translation done.]

* NOTICES *
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damages caused by the use of this translation.
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]

[Field of the Invention] This invention relates to the organic light emitting device using the electroluminescence phenomenon of an organic thin film.

[0002]

[Description of the Prior Art] Drawing 9 is the simple block diagram of an organic light emitting device. This organic light emitting device carries out film formation of the electron hole transportation layer 13, a luminous layer 14, and the electronic transportation layer 15 one by one on the transparent glass substrate 11 which carried out film formation of the anode plate 12, and has further structure which carried out film formation of the cathode 16 at the electronic transportation layer 15 so that it may illustrate. In addition, a glass substrate 11 has some which were formed by transparent plastics material.

[0003] The anode plate 12 is formed with the large metal and large alloy of a work function. Specifically, it is the electrode of the transparent conductive film formed using Au (copper), ITO (oxide of indium-tin), SnO2 (tin oxide), ZnO (zinc oxide), etc. In addition, thin film formation of the electrode 12 is carried out by approaches, such as vacuum deposition and sputtering, in the above-mentioned electrode material.

[0004] Moreover, film formation of the electron hole transportation layer 13, a luminous layer 14, and the electronic transportation layer 15 is carried out by organic material (organic compound). Specifically, it is tris (8-hydroxy kino RIRATO) aluminum (Alq3) and N, N-screw (3-methylphenyl)-N, and N-diphenyl. - (1 and 1'-biphenyl) The low-molecular system ingredient represented by -4 and 4'-diamine (TPD) and the macromolecule system ingredient represented with a Polly P-phenylenevinylene (PPV) derivative are used.

[0005] The above-mentioned cathode 16 is formed with the mixture of the small metal and small alloy of a work function, or a these metals and an alloy. Specifically, it is the electrode which carried out thin film formation of calcium (calcium), aluminum (aluminum), an aluminum-Li (lithium) alloy, a Mg(magnesium)-Ag (silver) alloy, a Mg-aluminum alloy, the Mg-In (indium) alloy, etc. by approaches, such as vacuum deposition and sputtering.

[0006] When the above-mentioned organic light emitting device impresses direct current voltage to an anode plate 12 and cathode 16, the electron hole poured in from an anode plate 12 is sent to a luminous layer 14 through the electron hole transportation layer 13. Moreover, the electron poured in from cathode 16 is sent to a luminous layer 14 through the electronic transportation layer 15. In a luminous layer 14, an electron hole and an electron recombine, by this, the organic material of a luminous layer 14 will be in an excitation state, and an exciton generates.

[0007] Thus, the generated exciton diffuses the inside of a luminous layer 14, deexcitation is carried out continuously to that ground state, light is then emitted, and this luminescence is injected through the electron hole transportation layer 13, an anode plate 12, and a glass substrate 11.

[0008] Drawing 10 is the simple block diagram of the organic light emitting device constituted so that a luminous layer 14 might serve as the electronic transportation layer 15. As for this light emitting device, film formation of the anode plate 12 is carried out at a glass substrate 11, the laminating of the electron hole transportation layer 13 and the luminous layer 14 is carried out on it, and film formation of the cathode 16 is carried out at the luminous layer 14.

[0009] Drawing 11 is a simple block diagram of an organic light emitting device with which a luminous layer 14 serves as the electron hole transportation layer 13. As for this light emitting device, film formation of the anode plate 12 is carried out at a glass substrate 11, the laminating of a luminous layer 14 and the electronic transportation layer 15 is carried out on it, and film formation of the cathode 16 is carried out at the electronic transportation layer 15.

[0010] Drawing 12 is the simple block diagram of the organic light emitting device which is not equipped with the electron hole transportation layer 13 and the electronic transportation layer 15. As for this light emitting device, film formation of the anode plate 12 is carried out at a glass substrate 11, the laminating of the luminous layer 14 is carried out on it, and film formation of the cathode 16 is carried out at the luminous layer 14.

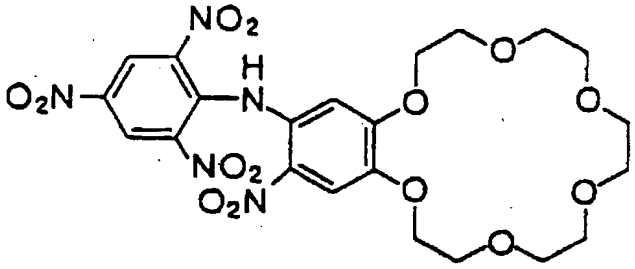
[0011] The organic light emitting device shown in drawing 10 , drawing 11 , and drawing 12 emits light by

impressing direct current voltage to an anode plate 12 and cathode 16 like the organic light emitting device shown in drawing 9 , and this luminescence injects it through an anode plate 12 and a glass substrate 11.
[0012]
[Problem(s) to be Solved by the Invention] Luminescence brightness falls for the cathode material component to diffuse from a cathode material component entering and diffusing the above-mentioned organic light emitting device in a luminous layer or other organic layers during a luminescence drive.
[0013] Moreover, if a cathode material component is spread in an organic layer, the problem that leakage current may flow to an anode plate through this cathode material component, and an organic light emitting device may not emit light for this reason will arise.
[0014] This invention aims at offering the organic light emitting device which prevents the cathode material component included in an organic layer in view of the above-mentioned actual condition, and emits light certainly [raise luminescence brightness and].
[0015]
[Means for Solving the Problem] In order to attain the above-mentioned purpose, this invention relates to the organic light emitting device which becomes a transparence substrate side from the cathode which carried out membrane formation formation on the field of the transparent anode plate which carried out membrane formation formation, the organic layer which carried out the laminating to the film surface of this anode plate, and this organic layer.
[0016] And in one invention of **, the ligand layer which carries out complexing to a metal is prepared in the interface of an organic layer and cathode, and the organic light emitting device characterized by considering as the configuration which prevents the cathode material component diffused in an organic layer from cathode is proposed.
[0017] The ligand which carries out complexing to a metal is made to mix in an organic layer as the 2nd invention, and the organic light emitting device characterized by considering as the configuration which prevents the cathode material component diffused in an organic layer from cathode is proposed.
[0018] As the 3rd invention, the ligand which carries out complexing to a metal is distributed, a ligand layer is formed into the polymer-matrix of an organic layer, and the organic light emitting device characterized by considering as the configuration which prevents the cathode material component diffused in an organic layer from cathode is proposed.
[0019]
[Function] Thus, the ligand made to mix in the ligand layer or the organic layer prepared between an organic layer and cathode or into the polymer-matrix of an organic layer carries out complexing of the constituted organic light emitting device to a cathode material component, and the cathode material component diffused in an organic layer is prevented. Consequently, the leakage current which there is no fall of the luminescence brightness by the cathode material component, and flows to an anode plate through a cathode material component does not occur.
[0020]
[Embodiment of the Invention] Next, the operation gestalt of this invention is explained along with a drawing. Drawing 1 is the simple block diagram showing the operation gestalt of the organic light emitting device which prepared the ligand layer.
[0021] The organic light emitting device of this operation gestalt carries out sequential membrane formation formation of the transparent anode plate 12, the electron hole transportation layer 13, a luminous layer 14, and the electronic transportation layer 15 like the conventional example on the transparent field of glass substrate 11 (or transparent plastic plate) 11, further, carries out thin film formation of the ligand layer 10 on the electronic transportation layer 15, and has considered it as the configuration which carried out membrane formation formation by using cathode 16 as a metal electrode on the field of this ligand layer 10.
[0022] The ligand layer 10 prepared between the electronic transportation layer 15 and cathode 16 as

mentioned above acts as a buffer layer which forms a cathode material component (metal) and a complex. That is, a complex is made to form the metal which it is going to diffuse from cathode 16 to an organic layer (13, 14, 15) in the ligand layer 10, and the diffusion to an organic layer is prevented.

[0023] The above-mentioned ligand layer 10 can use a ligand ingredient as shown below.

クラウンエーテル誘導体



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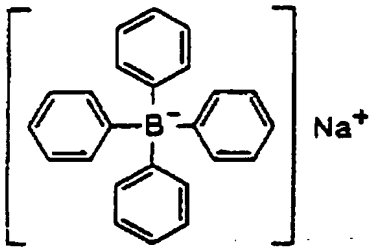
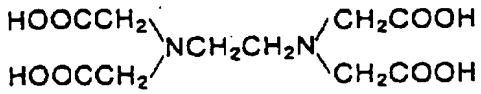


アミン系化合物



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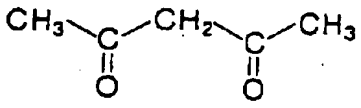
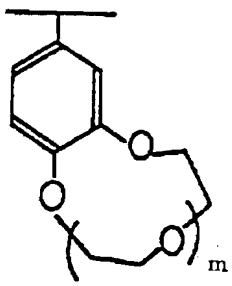


高分子配位子



m＝3，4

[0024] Moreover, thin film formation of the ligand layer 10 can be carried out using the above-mentioned ligand ingredient according to dry processes, such as wet process, such as SUPINKO-TO and DIPPUKO-TO, or vacuum deposition.
[0025] Drawing 2 is the gestalt carried out to the same organic light emitting device as the conventional example to which a luminous layer 14 serves as an electronic transportation layer, and, in the case of this light emitting device, the ligand layer 10 described above between a luminous layer 14 and cathode 16 is formed.
[0026] Drawing 3 is the gestalt carried out to the same organic light emitting device as the conventional example to which a luminous layer 14 serves as an electron hole transportation layer, and, in the case of this light emitting device, the ligand layer 10 described above between the electron hole transportation layer 15 and cathode 16 is formed.
[0027] Drawing 4 is the gestalt carried out to the same organic light emitting device as the conventional example to which a luminous layer 14 serves both as an electronic transportation layer and an electron hole transportation layer, and, in the case of this light emitting device, the ligand layer 10 described above between a luminous layer 14 and cathode 16 is formed.
[0028] On the other hand, a ligand layer can be prepared as film distributed in the polymer-matrix of an organic layer for adjustment of improvement in membrane formation nature, and the amount of ligands.
[0029] That is, when carrying out membrane formation formation of the ligand layer by wet process, the ligand layer which carried out ligand distribution can be formed into a polymer-matrix by melting a ligand ingredient to a solvent and forming membranes with high molecular compounds, such as polystyrene which is an organic material, a polymethyl methacrylate, and a polycarbonate.
[0030] Moreover, when carrying out membrane formation formation by the dry process, a ligand layer can be formed by vapor-depositing a ligand ingredient to coincidence at the time of the vacuum evaporationo polymerization of a polymer, and distributing a ligand in a polymer-matrix.
[0031]
[Example 1] On the field of the substrate which carried out thin film formation as an anode plate 12, ITO to a glass substrate 11 as a luminous layer 14 poly (2-methoxy, 5-(2'-ethyl-hexoxy)-1, -phenylene-vinylene) (MEH-PPV) is formed by SUPINKO-TO. On it as a ligand layer 10 The laminating of the acetylacetone was carried out by SUPINKO-TO, and calcium was further vapor-deposited as cathode 16, then aluminum was vapor-deposited, membranes were formed, and the organic light emitting device was constituted.
[0032] When this organic light emitting device was driven and evaluated, there is no early brightness fall and the half line of brightness was prolonged in about 4 times. (conventional article: -- an early brightness decreasing rate -- the half line of 40% and brightness -- 5 hours) the phenomenon which stops emitting light according to leakage current was not seen again. In addition, the rate of the object with which, as for an early brightness decreasing rate, brightness falls by the initial stage, and half line are time amount until brightness is halved.
[0033] Drawing 5 is the simple block diagram showing the operation gestalt of the organic light emitting device which made the ligand mix in an organic layer. The organic light emitting device of this operation gestalt is the substrate which carried out film formation of the transparent anode plate 12 at the transparent glass substrate (or transparent plastic plate) 11 with the configuration which carried out membrane formation formation of electron hole transportation layer 13C, luminous layer 14C, electronic transportation layer 15C, and the cathode 16 one by one.
[0034] In this organic light emitting device, although it is the same as that of the conventional example, about the organic layer of electron hole transportation layer 13C, luminous layer 14C, and electronic transportation layer 15C, an anode plate 12 and cathode 16 make a ligand ingredient mix in the organic material explained in the conventional example, and are formed.
[0035] As described above, diketone system compounds, such as amine system compounds, such as a crown ether derivative, a tetraphenyl borate derivative, and EDTA, and an acetylacetone, and the

polymer (macromolecule ligand) which contains these as functional groups can be used for a ligand ingredient.

[0036] As a means to make a ligand mix in electron hole transportation layer 13C, luminous layer 14C, and electronic transportation layer 15C, an organic material and a ligand ingredient are dissolved and membranes are formed according to wet process, or according to a dry process, the coincidence vacuum evaporationo of an organic material and the ligand ingredient can be carried out, and membranes can be formed.

[0037] Thus, the cathode material component which it diffuses in an organic layer since the ligand which made the constituted organic light emitting device mix in an organic layer forms a metal and a complex decreases. Consequently, there are few falls of luminescence brightness, they decrease also about leakage current, and become what has certain luminescence.

[0038] The operation gestalt of the organic light emitting device which drawing 8 does not equip with electron hole transportation layer 13C and electronic transportation layer 15C for the operation gestalt of the organic light emitting device which drawing 7 does not equip with electron hole transportation layer 13C for the operation gestalt of the organic light emitting device which drawing 6 does not equip with electronic transportation layer 15C is shown respectively.

[0039] in addition, a ligand is good also as two-layer [of them], or a configuration which boils further, attaches and is made to mix, although you may mix in all the layers of electron hole transportation layer 13C, luminous layer 14C, and electronic transportation layer 15C.

[0040]

[Example 2] ITO was formed as an anode plate 12 to the glass substrate 11, and the component substrate was formed. and the inside of MEH-PPV which is a luminescent organic material -- as a ligand ingredient -- an acetylacetone -- 10wt(s)% -- it mixed, and membrane formation formation of these ingredients was carried out by SUPINKO-TO in the above-mentioned component substrate side, then calcium and aluminum were formed by vacuum evaporationo, and the organic light emitting device was constituted.

[0041] Thus, when the constituted organic light emitting device was driven and evaluated, there is no early brightness fall and the half line of brightness was prolonged in about 3 times. (conventional article: -- an early brightness decreasing rate -- the half line of 40% and brightness -- 5 hours)
Moreover, the phenomenon which stops emitting light according to leakage current was not seen.

[0042] As mentioned above, although the operation gestalt of this invention was explained, it is possible to carry out also by the approach of placing a ligand ingredient on the organic layer which it described above and also formed membranes by wet process and the dry process, and carrying out thermal diffusion, applying heat.

[0043]

[Effect of the Invention] By this invention, a ligand forms a cathode material component and a complex, and since it considered as the configuration which decreases the cathode material component diffused in an organic layer as much as possible, there are few falls of luminescence brightness and they serve as an organic light emitting device which moreover emits light certainly, as described above.

[Translation done.]

2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the simple block diagram of an organic light emitting device showing the operation gestalt which prepared the ligand layer.
[Drawing 2] It is the same simple block diagram as drawing 1 showing the operation gestalt of the organic light emitting device of a configuration of that a luminous layer serves as an electronic transportation layer.
[Drawing 3] It is the same simple block diagram as drawing 1 showing the operation gestalt of the organic light emitting device of a configuration of that a luminous layer serves as an electron hole transportation layer.
[Drawing 4] It is the same simple block diagram as drawing 1 showing the operation gestalt of the organic light emitting device of a configuration of that a luminous layer serves both as an electronic transportation layer and an electron hole transportation layer.
[Drawing 5] It is the ** simple block diagram of an organic light emitting device showing the operation gestalt which made the ligand mix in an electron hole transportation layer, a luminous layer, and an electronic transportation layer.
[Drawing 6] It is the same simple block diagram as drawing 5 showing the operation gestalt of the organic light emitting device of a configuration of that a luminous layer serves as an electronic transportation layer.
[Drawing 7] It is the same simple block diagram as drawing 5 showing the operation gestalt of the organic light emitting device of a configuration of that a luminous layer serves as an electron hole transportation layer.
[Drawing 8] It is the same simple block diagram as drawing 5 showing the operation gestalt of the organic light emitting device of a configuration of that a luminous layer serves both as an electronic transportation layer and an electron hole transportation layer.
[Drawing 9] It is the simple block diagram of the organic light emitting device shown as a conventional example.
[Drawing 10] It is the same simple block diagram as drawing 9 showing the conventional organic light emitting device of a configuration of that a luminous layer serves as an electronic transportation layer.
[Drawing 11] It is the same simple block diagram as drawing 9 showing the conventional organic light emitting device of a configuration of that a luminous layer serves as an electron hole transportation layer.
[Drawing 12] It is the same simple block diagram as drawing 9 showing the conventional organic light emitting device of a configuration of that a luminous layer serves both as an electron hole transportation layer and an electronic transportation layer.
[Description of Notations]
10 Ligand Layer
11 Glass Substrate
12 Anode Plate
13 13C Electron hole transportation layer
14 14C Luminous layer
15 15C Electronic transportation layer
16 Cathode

[Translation done.]